

# **Spot Safety Project Evaluation**

Project Log # 200501210

Spot Safety Project # 06-95-201

**Spot Safety Project Evaluation of the Directional Crossover Installation,  
At the Intersection of US 401-Raeford Road at SR 1546-Little Drive-Falcon Village Shopping Center  
In Fayetteville, Cumberland County**

Documents Prepared By:

Safety Evaluation Group  
Traffic Safety Systems Management Section  
Traffic Engineering and Safety Systems Branch  
North Carolina Department of Transportation

**Principal Investigator**

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09/14/2005

Date

# ***Spot Safety Project Evaluation Documentation***

## **Subject Location**

Evaluation of Spot Safety Project Number 06-95-201 – The Intersection of US 401-Raeford Road at SR 1546-Little Drive-Falcon Village Shopping Center, in Fayetteville, Cumberland County

## **Introduction**

In an attempt to assess the safety of our roads, the Safety Evaluation Group of the Traffic Safety Systems Management Section has evaluated the above project. The methodologies used in this evaluation offer various philosophies and ideas, in an effort to provide objective countermeasure crash reduction results. A naive before and after analysis has been completed to measure the effectiveness of the spot safety improvement. Additional analysis methods were not utilized for this evaluation because a suitable comparison group was unattainable. This information is provided to you so the benefit or lack of benefit for this type of project can be recognized and utilized for future projects.

## **Project Information and Background from the Project File Folder**

The spot safety project improvement countermeasures chosen for the subject location were pavement widening on US 401-Raeford Road and construction of raised islands in the crossover to prevent through and left turn movements from the side street approaches. Bill Rosser PE, Division Engineer, originally requested the directional crossover. US 401-Raeford Road is a multi-lane divided facility with a speed limit of 45 mph at this location. Both side streets are under stop sign control.

The median crossover serves as an entrance to Falcon Village Shopping Center and an apartment complex to the south and to SR 1546-Little Drive to the north. Traffic signals exist at the intersections of US 401-Raeford Road at SR 1141-Bingham Road and US 401-Raeford Road at SR 1411-Bunce Road (the intersections to the east and west of the treatment location). Severe traffic accident patterns occurred at the crossover as a result of vehicles attempting to maneuver through the heavy traffic volumes on US 401-Raeford Road.

The initial crash analysis for this location was completed from December 1, 1991 through November 30, 1994 with a total of 60 reported crashes. According to the initial analysis, there were 45 Rear End crashes, six Angle crashes, four Ran Off Road crashes, and five “Random in Nature” crashes. One fatality, seven class B injuries, and 37 class C injuries resulted. The final completion date for the directional crossover installation at the subject intersection was on March 31, 1997.

## Naive Before and After Analysis

After reviewing the spot safety project file folder along with all the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period was from January 1, 1997 through June 30, 1997. The before period consisted of reported crashes from January 1, 1990 through December 31, 1996 (7 Years) and the after period consisted of reported crashes from July 1, 1997 through June 30, 2004 (7 Years). The dates for this analysis were limited by the unavailability of crash data prior to 1990. Please see attached the *Location Map* and the aerial photograph for further detail.

The attached data Table 1 depicts the Naive Before and After Analysis for the Treatment Intersection, consisting of an overall crash summary and a crash type summary. The overall crash summary contains high level crashes, crash rates, and vehicle exposure statistics. The crash type summary contains crashes broken down by accident type. Before period crash data, after period crash data, and the percent change in crashes from the before to the after period are also included. The treatment data consisted of all crashes within a 0 feet Y-Line of the subject intersection.

As shown in Table 1, the naive before and after analysis at the Treatment Intersection resulted in a 85.7 percent decrease in Total Crashes, a 19.6 percent increase in the Severity Index, and a 12.2 percent increase in Average Daily Traffic (ADT). The before period ADT year was 1993, and the after period ADT year was 2000. Analysis of the treatment location also resulted in a 100 percent decrease in Angle crashes, an 87.2 percent decrease in Frontal Impact crashes, and a 90.9 percent decrease in Rear End crashes. All crash types decreased from the before to the after period.

In order to test for crash migration, a naive before and after analysis was also performed at both signalized intersections west and east of the treatment location and on US 401-Raeford Road within the treatment influence area. The two intersections with US 401-Raeford Road that were analyzed are as follows: US 401-Raeford Road at SR 1141-Bingham Road and US 401-Raeford Road at SR 1411-Bunce Road. The section on US 401-Raeford Road that was analyzed is from 150' west of SR 1411-Bunce Road to 150' east of SR 1141-Bingham Road. The data for both signalized intersections and the section consisted of all crashes within a 150 feet Y-line. The following table is a summary of Total Crashes within the treatment influence area.

### Overall Total Crash Summary within Treatment Influence Area

	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-)/ Percent Increase (+)</b>
Treatment Intersection	56	8	- 85.7
US 401-Raeford Road at SR 1141-Bingham Road	154	138	- 10.4
US 401-Raeford Road at SR 1411-Bunce Road	83	54	- 34.9
US 401-Raeford Road Section	390	243	- 37.7

The naive before and after analysis at the signalized intersections surrounding the treatment resulted in a 10.4 percent decrease and a 34.9 percent decrease in Total Crashes. Analysis of US 401-Raeford Road within the treatment influence area resulted in a 37.7 percent decrease in Total Crashes.

## Results and Discussion

The naive before and after analysis at the Treatment Intersection resulted in an 85.7 percent decrease in Total Crashes and a 19.6 percent increase in the Severity Index. Analysis of the treatment location also resulted in an 87.2 percent decrease in Frontal Impact Crashes. All crash types experienced a decrease from the before to the after period.

The raised islands constructed in the crossover prevent through and left turn movements for both side street approaches. Motorists wishing to make these movements need to find an alternative route (i.e. potential crash migration occurs). Therefore, the effect of the treatment on surrounding intersections must remain in consideration while assessing analysis of the Treatment Intersection. The naive before and after analysis of the signalized intersections on either side of the treatment location resulted in a 10.4 percent decrease and a 34.9 percent decrease in crashes. The section on US 401-Raeford Road that was analyzed from 150' west of SR 1411-Bunce Road to 150' east of SR 1141-Bingham Road displayed a 37.7 percent decrease in crashes. A majority of crashes on this section were concentrated at the treatment intersection and at the two signalized intersections.

A detailed review of crash reports in the after period at the intersections of US401-Raeford at SR 1411-Bunce Road and US401-Raeford at SR 1141-Bingham Road reveals no crash trends attributable to the treatment location. Possible U-turn crashes were examined at both signalized intersections. These crashes had the potential to increase in the after period because of the movements prohibited at the treatment location. Possible U-turn crashes involved either Rear-End Crashes in the left-turn lanes or involved conflict between left-turning vehicles and oncoming vehicles on US 401-Raeford Road. There was no increase in the number of crashes involving U-turns at either of the surrounding signalized intersections.

The summary results above demonstrate that in the naive before and after analysis method the treatment location appears to have had a crash reduction in all crash types from the before to the after period. In addition, when looking at the .31-mile strip surrounding the treatment location and both surrounding signalized intersections, there is also a reduction in crashes. Please see the attached *Treatment Site Location Photos*. Photos are provided of the treatment intersection and of the surrounding signalized intersections.

Please note that during the site visit most of the businesses within the Falcon Village Shopping Center were closed and the parking lot was nearly empty. The date of the closures is unknown. This will clearly reduce the traffic volumes and possibly minimize related crash patterns at the treatment location in the after period. A car wash and a bank are still open near the Shopping Center and an apartment complex is located behind the Shopping Center. Motorists are still gaining access to these locations using the Falcon Village access road.

The countermeasure crash reduction for Total Crashes at the subject intersection is a 85.7 percent decrease in crashes. The countermeasure crash reduction for Frontal Impact Crashes at the subject intersection is an 87.2 percent decrease in crashes. As the Safety Evaluation Group completes additional spot safety reviews for this type of countermeasure, we will be able to provide objective and definite information regarding actual crash reduction factors.

Additional analysis of the crash data at the treatment location from July 1, 2003 through December 31, 2004 (1 year, 7 months) reveals that two crashes occurred within this time subsequent to the after period. There was one Sideswipe crash and one Rear End crash, resulting in no injuries.

**Table 1. Treatment Intersection Overall Crash Summary and Crash Type Summary**

<b>OVERALL CRASH SUMMARY</b>	<b>Before Period</b>	<b>After Period</b>	<b>Percent Change</b>
Total Crashes	56	8	-85.7
Fatal Crashes	0	0	n/a
Non-Fatal Injury Crashes	28	5	-82.1
Total Injury Crashes	28	5	-82.1
PDO Crashes	28	3	-89.3
Night Crashes	13	2	-84.6
Wet Crashes	13	2	-84.6
Annual ADT	31200	35000	12.2
Total Vehicle Exposure	79.79	76.68	-3.9
Severity Index	4.70	5.62	19.6

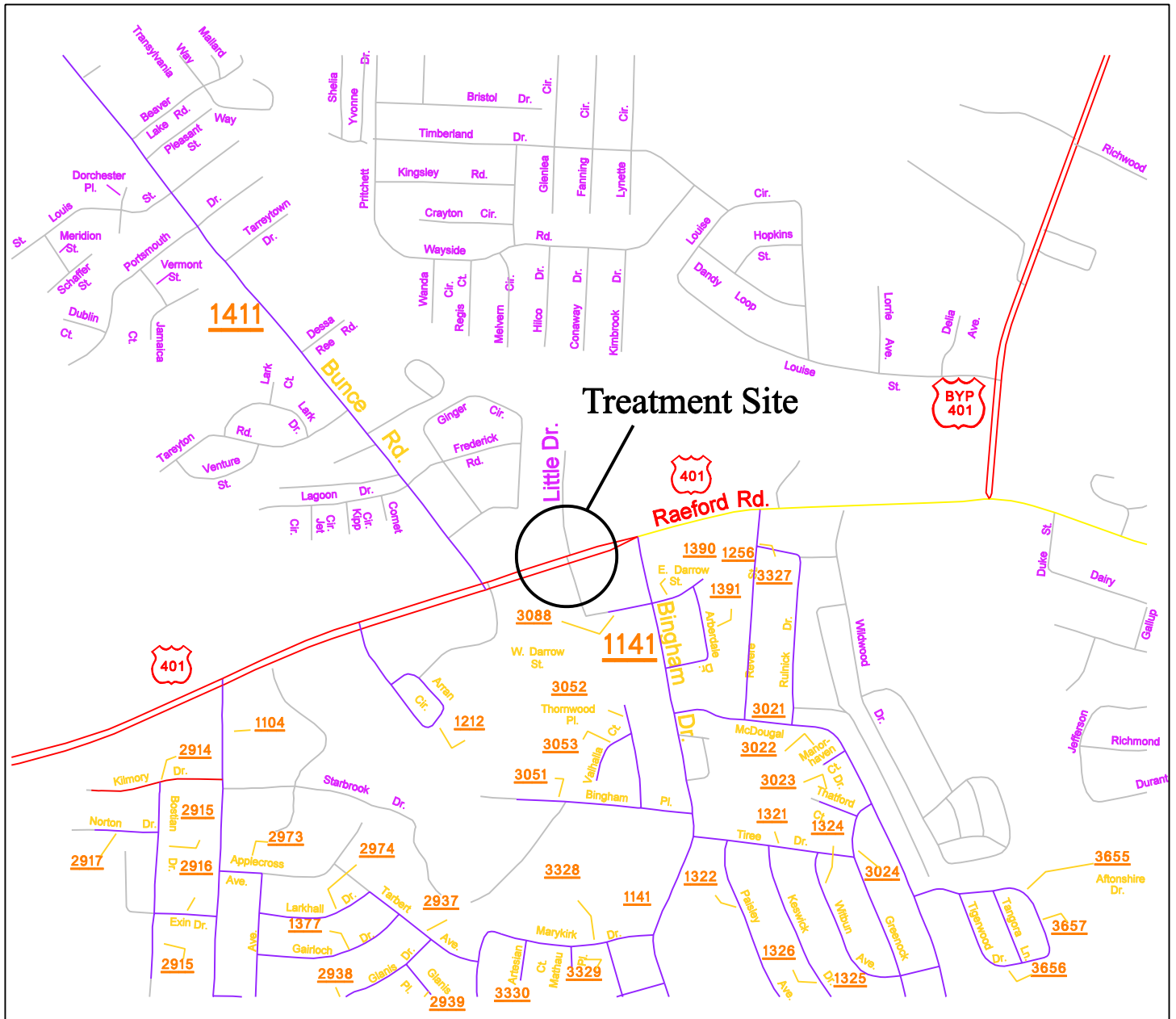
<b>CRASH TYPE SUMMARY</b>	<b>Before Period</b>	<b>After Period</b>	<b>Percent Change</b>
Angle	27	0	-100.0
Fixed Object	0	1	n/a
Left Turn, Different Roadways	4	0	-100.0
Left Turn, Same Roadway	6	4	-33.3
Parked Motor Vehicle	1	0	-100.0
Pedestrian	1	0	-100.0
Ran Off Road - Straight	1	0	-100.0
Rear End, Slow or Stop	11	1	-90.9
Rear End, Turn	2	1	-50.0
Right Turn, Different Roadways	2	1	-50.0
Sideswipe, Same Direction	1	0	-100.0

*Aerial View of Treatment Location*



# Location Map

## In Fayetteville, Cumberland County



**Treatment Site: US 401 at SR 1546-Little Drive  
and Falcon Village Shopping Center**



*Treatment Site Photos (Taken on June 13, 2005)*



Looking west at the Treatment Location on US 401 – Raeford Road



Looking east at the Treatment Location on US 401 – Raeford Road



*Treatment Site Photos (Taken on June 13, 2005)*



Looking west toward SR 1411-Bunce Road

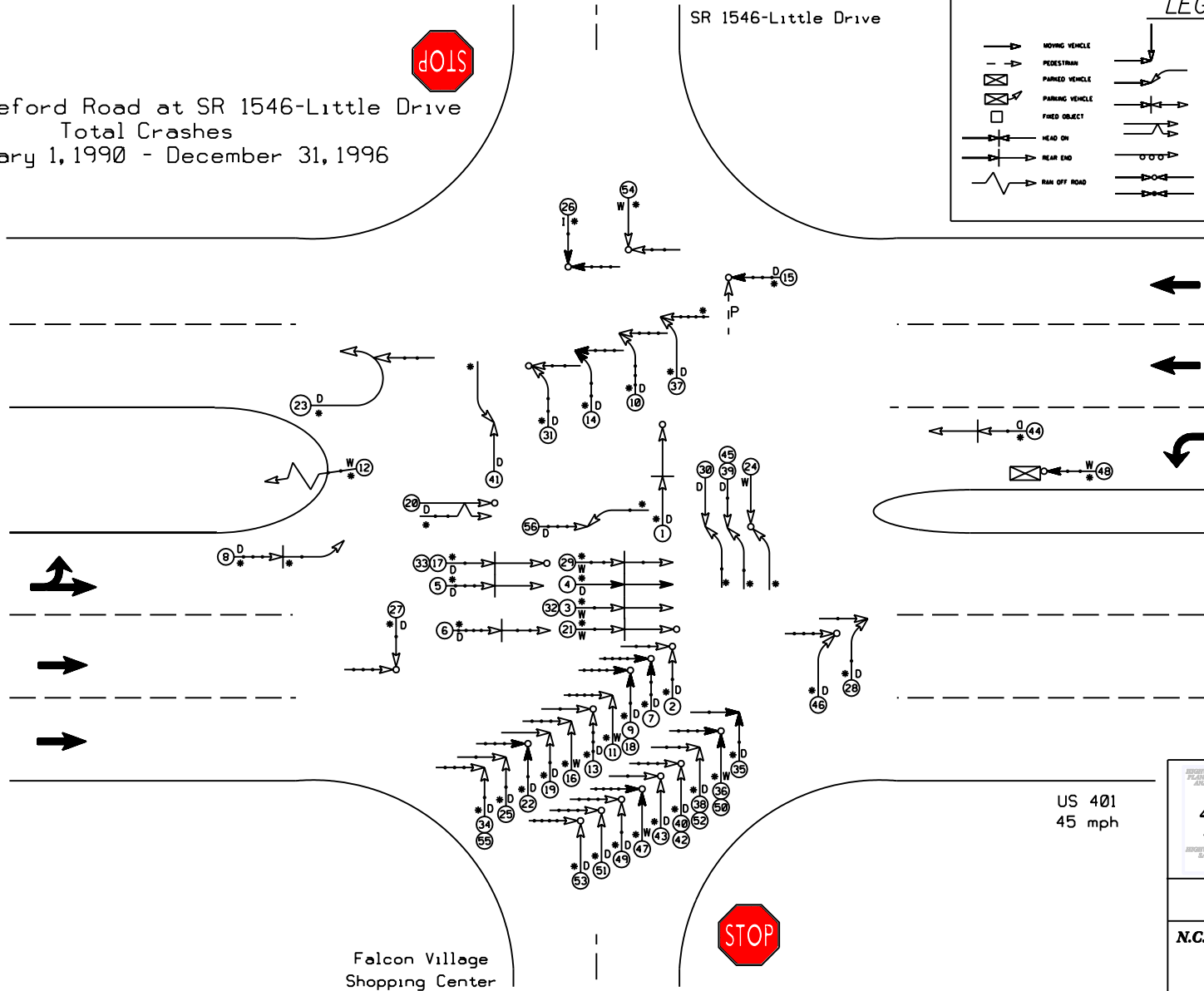
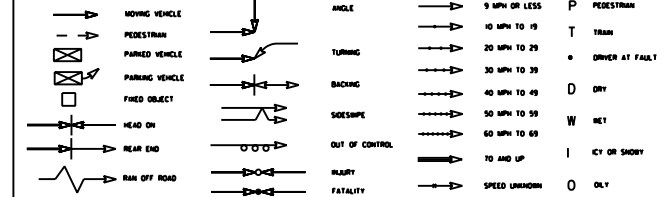


Looking east toward SR 1141-Bingham Road

US 401-RaeFord Road at SR 1546-Little Drive  
Total Crashes  
January 1, 1990 - December 31, 1996

SR 1546-Little Drive

# LEGEND



	STUDY PERIOD: 1/1/1990 - 12/31/1996
	ANALYSIS PREPARED BY: C. Shepton
	DIAGRAM PREPARED BY: C. Shepton
	SCALE: NOT TO SCALE
<p>Treatment Site Before Period</p>	DATE: 8/22/2005
	LOG NUMBER: 2005020
<p><b>N.C. DEPARTMENT of TRANSPORTATION</b> <b>DIVISION of HIGHWAYS</b></p>	

US 401-RaeFord Road at SR 1546-Little Drive

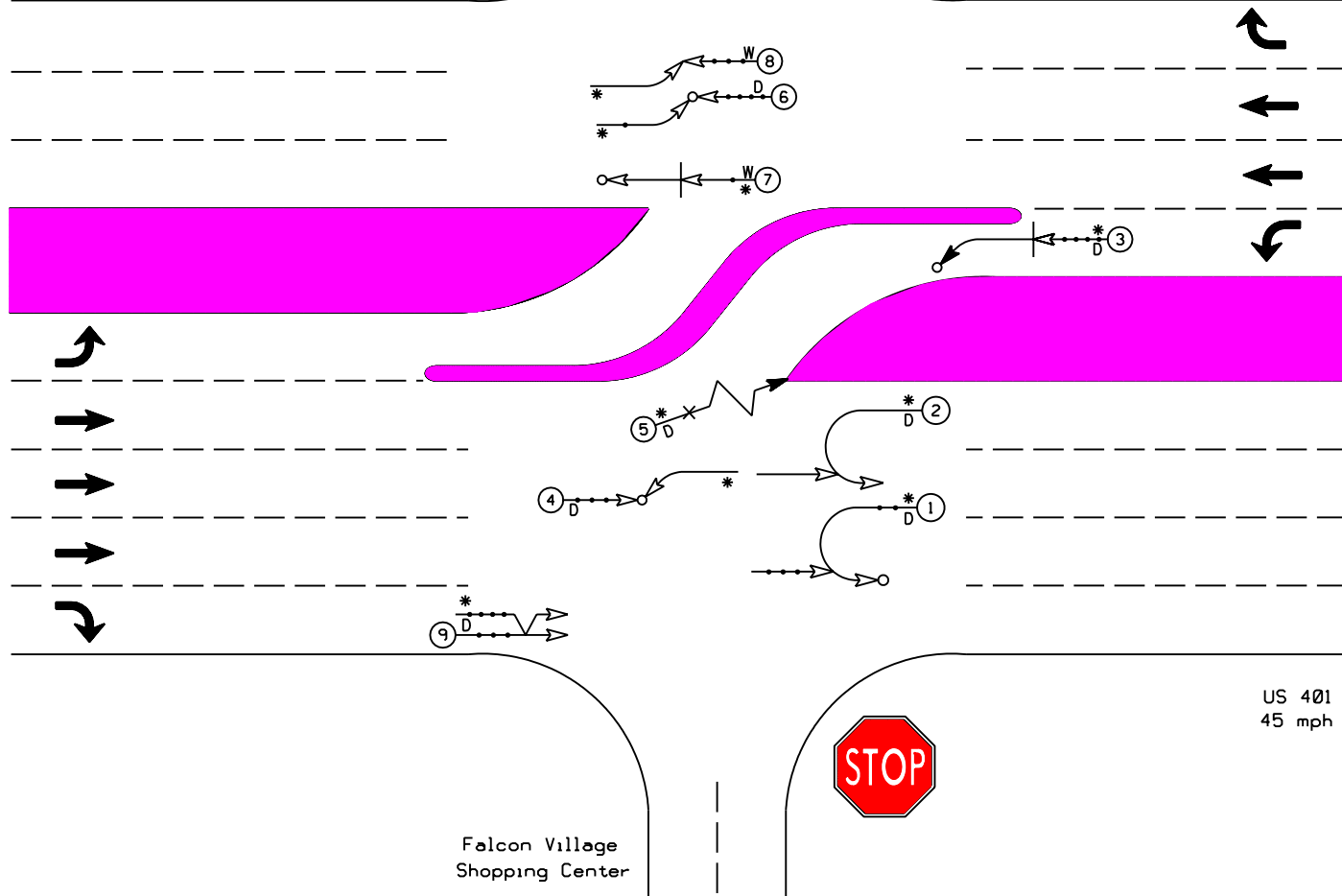
Total Crashes  
July 1, 1997 - June 30, 2004



SR 1546-Little Drive

# LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		P PEDESTRIAN
	PEDESTRIAN		T TURNING		40 MPH TO 49		T TRAM
	PAKED VEHICLE		B BACKING		20 MPH TO 29		* DRIVER AT FAULT
	FIXED OBJECT		S SIDESWIPE		30 MPH TO 39		D DRY
	H EAD ON		O UT OF CONTROL		40 MPH TO 49		W WET
	R EAR END		R UN OFF ROAD		50 MPH TO 59		I CE Y OR SNOW
	R UN OFF ROAD		F ATALITY		60 MPH TO 69		SPEED UNKNOWN
					70 AND UP		O ONLY



	STUDY PERIOD: 7/1/1997 - 6/30/2004
	ANALYSIS PREPARED BY: C Simpson
	DIAGRAM PREPARED BY: C Simpson
Treatment Site	SCALE: NOT TO SCALE
After Period	DATE: 8/26/2005
	LOG NUMBER: 2005000
<b>N.C. DEPARTMENT of TRANSPORTATION</b> <b>DIVISION of HIGHWAYS</b>	